Topical Fire Report Series

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Heating Fires in Residential Buildings (2013-2015)

These topical reports are designed to explore facets of the U.S. fire problem as depicted through data collected in the U.S. Fire Administration's National Fire Incident Reporting System. Each topical report briefly addresses the nature of the specific fire or fire-related topic, highlights important findings from the data, and may suggest other resources to consider for further information. Also included are recent examples of fire incidents that demonstrate some of the issues addressed in the report or that put the report topic in context.

Findings

- Each year, from 2013 to 2015, an estimated 45,900 heating fires in residential buildings were reported to fire departments within the United States and caused an estimated 205 deaths, 725 injuries, and $506 million in property loss.
- Heating was the second leading cause of all residential building fires, following cooking.
- Residential building heating fires peaked in the early evening hours from 5 to 9 p.m., with the highest peak from 6 to 8 p.m. This four-hour period accounted for 29 percent of all residential building heating fires.
- Residential building heating fire incidence peaked in January at 21 percent and declined to the lowest point during the months of June, July and August. Confined fuel burner/boiler malfunction fires accounted for 40 percent of the heating fires that occurred during these three warmer months.
- Confined fires, specifically those fires confined to chimneys, flues or fuel burners, accounted for 75 percent of residential building heating fires.
- The heat source was too close to combustibles in 29 percent of the nonconfined residential building heating fires.

Each year, from 2013 to 2015, an estimated average of 45,900 heating fires in residential buildings occurred in the U.S. and resulted in an annual average of 205 deaths, 725 injuries, and $506 million in property loss.[1,2,3] The term "heating fires" applies to those fires that are caused by central heating units, fixed or portable local heating units, fireplaces, heating stoves, chimneys and water heaters.[4]

Previously, especially during the late 1970s and early 1980s, heating was, by far, the leading cause of residential building fires. Stimulated in part by an energy shortage, this surge in heating fires was the result of the sudden increased use of alternative heating, particularly wood heating stoves and space heaters. Since then, the overall number of heating fires has substantially decreased. In 1983, there were 200,000 heating fires, but by 2015, that number had fallen to an estimated 41,200 (Table 1).[5,6] Despite this decline, from 2013 to 2015, heating remained the second-leading cause and accounted for 12 percent of all residential building fires responded to by fire departments across the nation.[7]

Table 1. National estimates of residential building heating fires and losses by year (2013-2015)

Year	Residential building heating fires	Residential building heating fire deaths	Residential building heating fire injuries	Residential building heating fire dollar loss
2013	49,000	200	725	$522,000,000
2014	47,600	245	850	$605,000,000
2015	41,200	165	575	$392,000,000

Sources: National Fire Incident Reporting System (NFIRS) 5.0, residential structure fire loss estimates from the National Fire Protection Association's (NFPA's) annual surveys of fire loss, and the U.S. Fire Administration's (USFA's) residential building fire loss estimates.

Notes: 1. Fires are rounded to the nearest 100, deaths to the nearest five, injuries to the nearest 25, and loss to the nearest million dollars.
2. The 2013 and 2014 dollar-loss values were adjusted to 2015 dollars.

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This topical report addresses the characteristics of residential building heating fires as reported to the NFIRS from 2013 to 2015 — the most recent data available at the time of the analysis.[8] For the purpose of this report, the term "residential heating fires" is synonymous with "residential building heating fires," as residential heating fires commonly mean those fires caused by heating that occur in buildings. The term "residential heating fires" is used throughout the body of this report; the findings, tables, charts, headings and endnotes reflect the full category "residential building heating fires."

Type of fire

Building fires are divided into two classes of severity in the NFIRS: "confined fires," which are fires confined to certain types of equipment or objects, and "nonconfined fires," which are fires that are not confined to certain types of equipment or objects. Confined building fires are small fire incidents that are limited in extent, staying within pots, fireplaces or certain other noncombustible containers.[9] Confined fires rarely result in serious injury or large content loss and are expected to have no significant accompanying property loss due to flame damage.[10]

Of the two classes of severity, 75 percent of residential heating fires were confined fires, as shown in Table 2. By comparison, from 2013 to 2015, 50 percent of all residential building fires were confined fires.[11]

Table 2. Residential building heating fires by type of incident (2013-2015)

Incident type	Percent
Nonconfined fires	25.49
Confined fires	74.51
Chimney or flue fire, confined to chimney or flue	51.65
Fuel burner/boiler malfunction, fire confined	22.86
Total	100.00

Source: NFIRS 5.0.

Loss measures

Table 3 presents losses, averaged over the three-year period from 2013 to 2015, for residential heating fires and all other residential building fires (i.e., excluding heating fires) reported to the NFIRS.[12] As can be expected, the average losses associated with nonconfined residential heating fires were notably high, since nonconfined fires generally include larger fires that more often result in serious injury and more content losses. The average losses of fatalities, injuries and dollar loss for residential heating fires were less than those for all other residential building fires.

Table 3. Loss measures for residential building heating fires (three-year average, 2013-2015)

Measure	Residential building heating fires	Confined residential building heating fires	Nonconfined residential building heating fires	Residential building fires (excluding heating fires)
Average loss				
Fatalities/1,000 fires	2.1	0.0	8.4	3.6
Injuries/1,000 fires	11.8	1.6	41.6	25.5
Dollar loss/fire	$7,690	$270	$29,380	$13,560

Source: NFIRS 5.0.

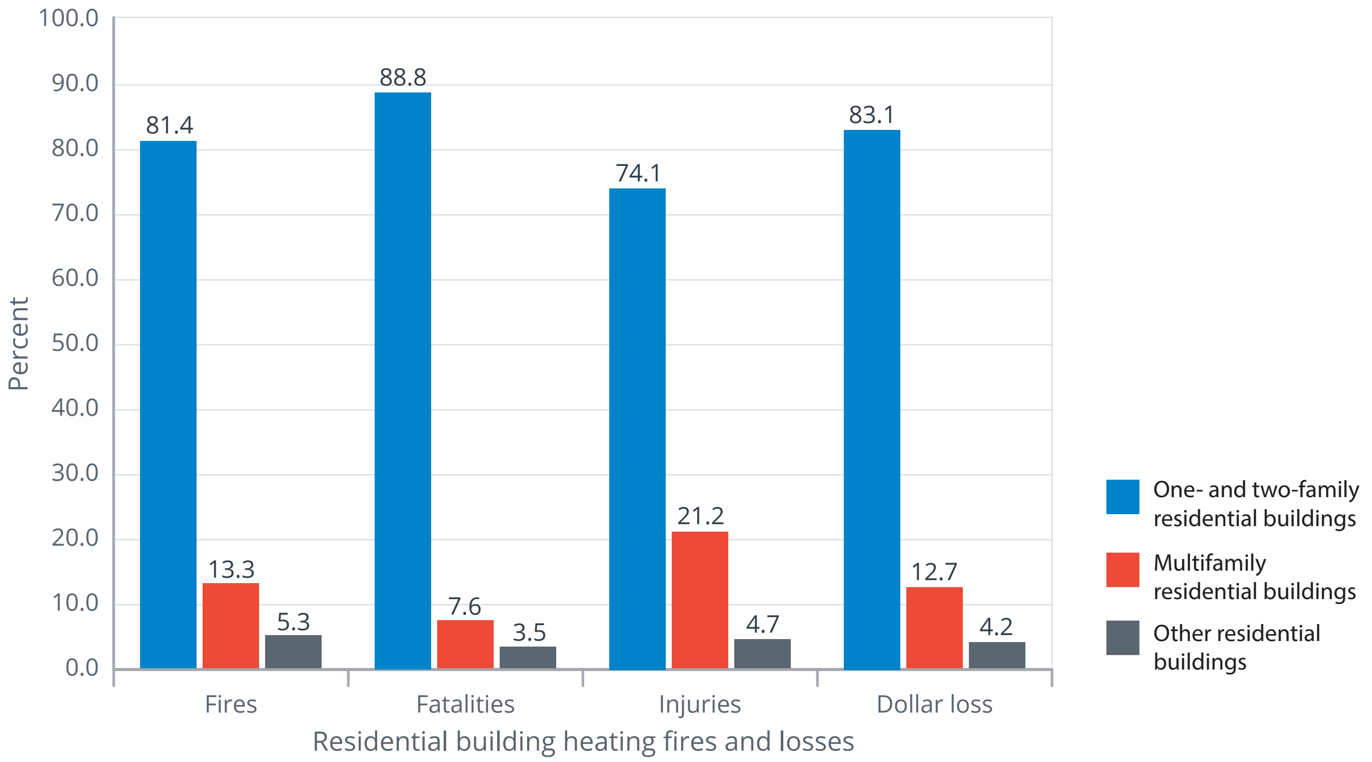
Notes: 1. No deaths in confined fires were reported to the NFIRS during 2013 to 2015; the resulting loss of 0.0 fatalities per 1,000 fires reflects only data reported to the NFIRS.
2. Average loss for fatalities and injuries is computed per 1,000 fires; average dollar loss is computed **per fire** and is rounded to the nearest $10.
3. The 2013 and 2014 dollar-loss values were adjusted to 2015 dollars.
4. The "Residential building fires (excluding heating fires)" category does not include fires of unknown cause.

Property use

Figure 1 presents the percentage distribution of residential heating fires and losses by property use (i.e., one- and two-family residential buildings, multifamily residential buildings, and other residential buildings).[13] One- and two-family residences were disproportionately represented in residential heating fires. In fact, 81 percent of residential heating fires occurred in one- and two-family residences — yet only 64 percent of all residential fires occurred in these types of residences.[14] An additional 13 percent of residential heating fires occurred in multifamily dwellings.

Consistent with the fact that the majority (81 percent) of residential heating fires took place in one- and two-family residential buildings, the percentages of fatalities (89 percent), injuries (74 percent) and dollar loss (83 percent) were also highest in these types of residences. One reason that heating played a larger role in one- and two-family fires than in multifamily and other residential fires is that one- and two-family residential buildings have fireplaces, chimneys and fireplace-related equipment that most other types of residences do not have.[15] In addition, multifamily residential buildings tend to have central heating systems that are maintained by professionals and not the homeowner; thus, there are fewer heating fires from poor maintenance or misuse than in one- and two-family dwellings.[16]

Figure 1. Residential building heating fires and losses by property use (2013-2015)

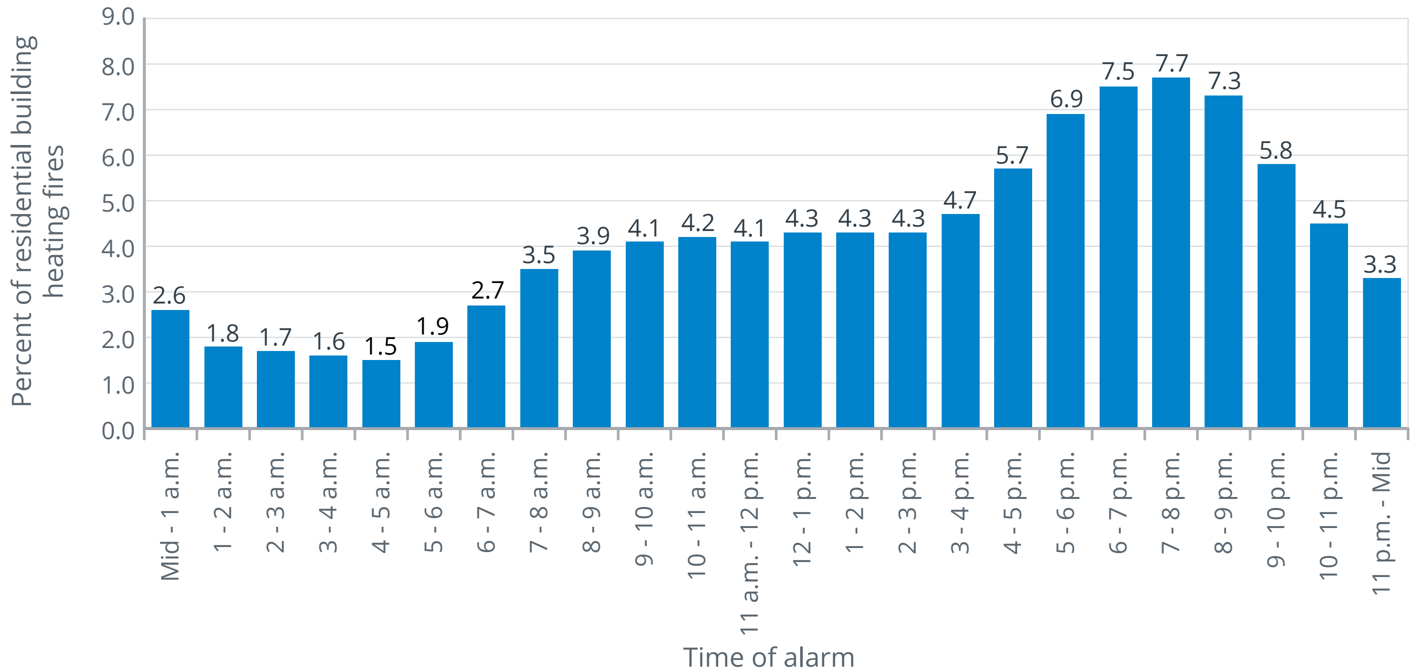


Source: NFIRS 5.0.
Notes: 1. The 2013 and 2014 dollar-loss values were adjusted to 2015 dollars.
2. Total percent of fatalities does not add up to 100 percent due to rounding.

When residential building heating fires occur

As shown in Figure 2, residential heating fires occurred mainly in the evening hours from 5 to 9 p.m., peaking from 6 to 8 p.m.[17] These fires declined throughout the night and early morning and reached their lowest point during the morning hours from 3 to 5 a.m. The four-hour evening period from 5 to 9 p.m. accounted for 29 percent of residential heating fires, and the two-hour morning period from 3 to 5 a.m. accounted for 3 percent. The confined fire incidents dominated the alarm profile and produced the pronounced peaks and valleys; the nonconfined fires experienced an early morning low and an evening peak as well, but were less pronounced.

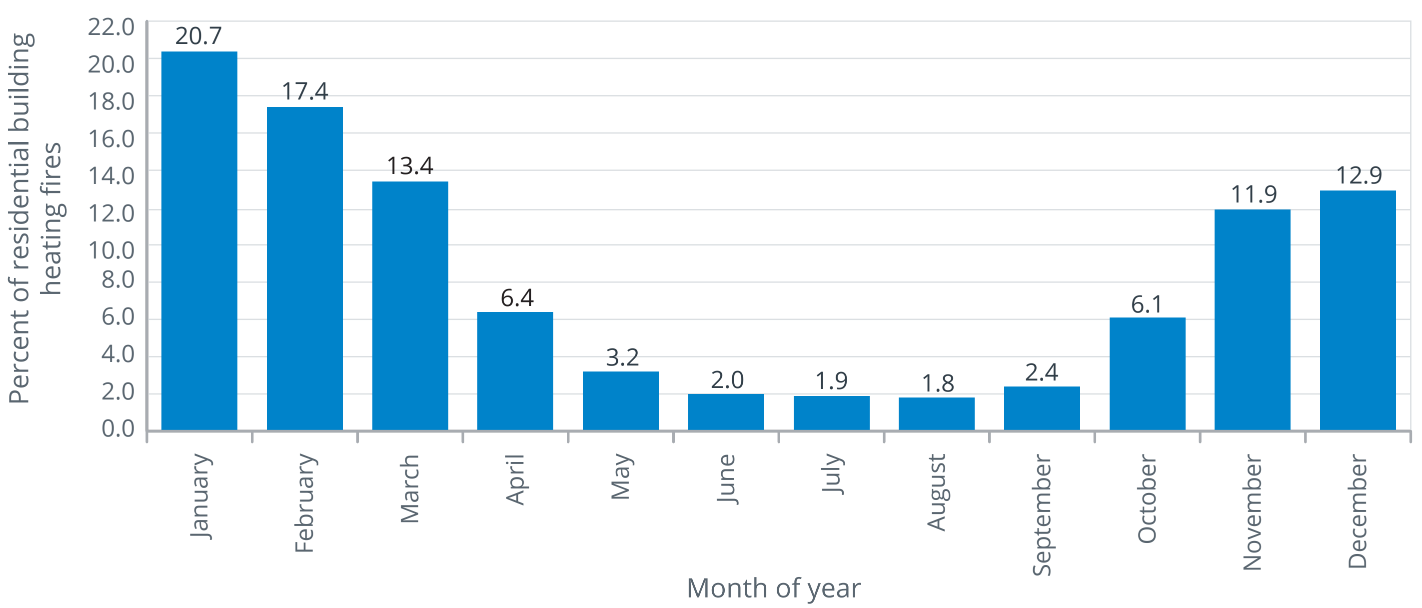
Figure 2. Residential building heating fires by time of alarm (2013-2015)



Source: NFIRS 5.0.
Note: Total does not add up to 100 percent due to rounding.

As expected, residential heating fires were most prevalent during the colder months from November through March, when the use of central heating systems, portable heaters and fireplaces is most common (Figure 3). The incidence of heating fires peaked in January at 21 percent. From March to August, fires declined from 13 percent to 2 percent. Fire incidence reached its lowest point during the warmer months of June, July and August, corresponding to reduced heating activities in residences. Confined fuel burner/boiler malfunction fires accounted for 40 percent of the heating fires that occurred during these three warmer months. Additionally, both confined and nonconfined residential heating fires also followed the overall pattern of winter peaks and summer lows.

Figure 3. Residential building heating fires by month (2013-2015)

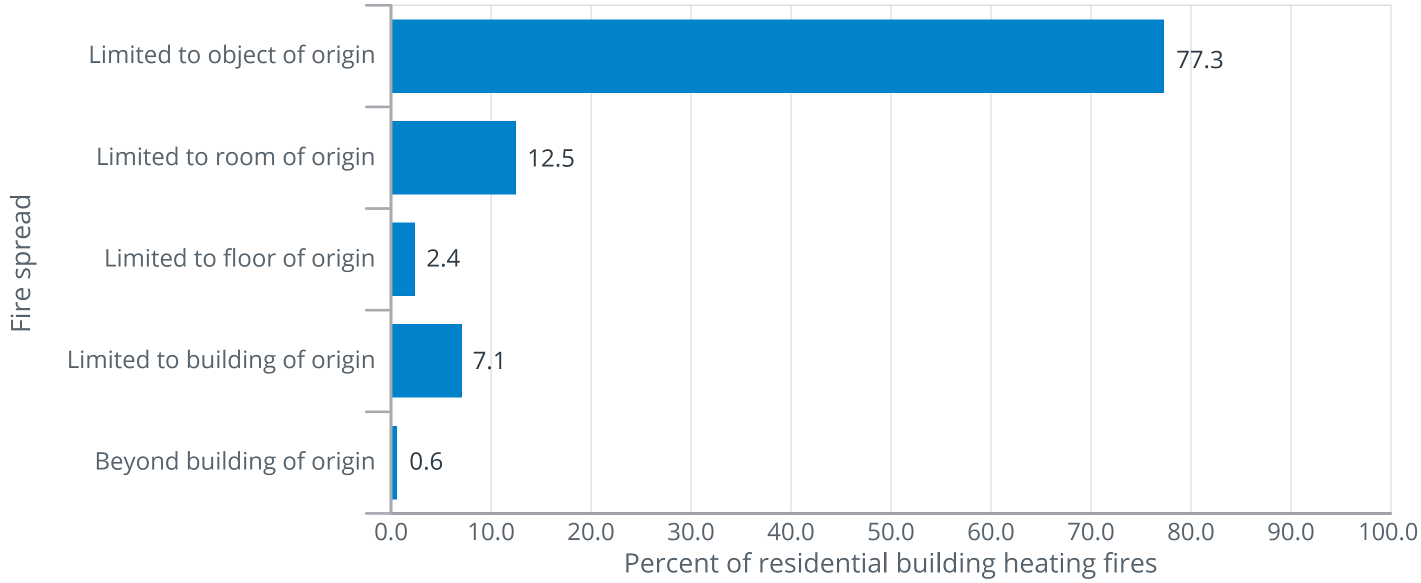


Source: NFIRS 5.0.
Note: Total does not add up to 100 percent due to rounding.

Fire spread in residential building heating fires

In 77 percent of residential heating fires, the fire was limited to the object of origin (Figure 4). These fires were primarily coded as "confined fires" in the NFIRS — 94 percent of residential heating fires limited to the object of origin were coded as confined fires. Few fires (10 percent) extended beyond the room of origin.

Figure 4. Extent of fire spread in residential building heating fires (2013-2015)



Source: NFIRS 5.0.
Note: Total does not add up to 100 percent due to rounding.

Confined fires

The NFIRS allows abbreviated reporting for confined fires. Many reporting details of these fires are not required, nor are they reported. (Not all fires confined to the object of origin are counted as confined fires.)[18] Confined residential heating fires accounted for 75 percent of residential heating fire incidents and dominated the "time of alarm" profile. The number of confined residential heating fires was greatest during the hours from 5 to 9 p.m., when they accounted for 82 percent of the residential heating fires that occurred during this period. Confined residential heating fires peaked in January, declined through May, and were lowest during the months of June, July and August.

Nonconfined fires

The next sections of this topical report address nonconfined residential heating fires — the larger and more serious fires — where more detailed fire data are available, as they are required to be reported in the NFIRS.

Where nonconfined residential building heating fires start (area of fire origin)

Six areas in the home — kitchens and cooking areas (14 percent), rooms that contain heating equipment or water heaters (12 percent), bedrooms (10 percent), family rooms or living rooms (9 percent), walls or concealed wall spaces (6 percent), and attics and vacant, crawl spaces (6 percent) — accounted for 57 percent of nonconfined residential heating fires (Table 4).

Table 4. Leading areas of fire origin in nonconfined residential building heating fires (2013-2015)

Areas of origin	Percent of nonconfined residential building heating fires (unknowns apportioned)
Kitchen, cooking area	14.4
Heating room or area, water heater area	11.9
Bedrooms	10.1
Common room, den, family room, living room, lounge	9.0
Wall assembly, concealed wall space	5.7
Attic: vacant, crawl space	5.6

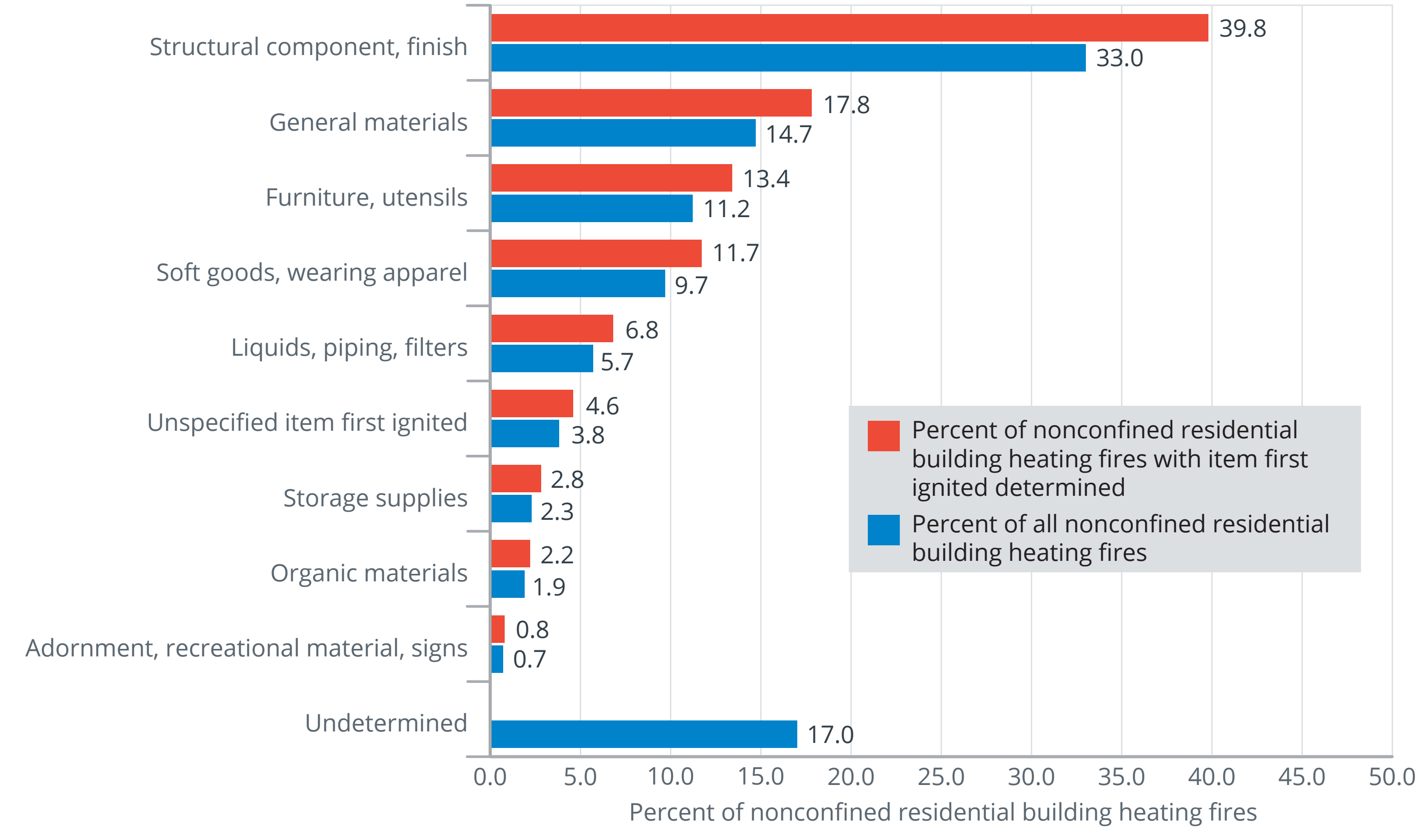
Source: NFIRS 5.0.

What ignites first in nonconfined residential building heating fires

Figure 5 shows that 40 percent of the items first ignited in nonconfined residential heating fires fell under the "structural component, finish" category. This category includes structural members or framing; exterior trim and finishes; interior wall coverings; and insulation within the walls, partitions and floor/ceiling surfaces. The second leading category was "general materials," a catchall category that includes items such as electrical wire insulation, trash/rubbish and residues (such as chimney residue). "General materials" accounted for an additional 18 percent of nonconfined residential heating fires.

Structural members or framing (16 percent) and electrical wire and cable insulation (12 percent) were the specific items most often ignited first in nonconfined residential heating fires. In an additional 5 percent of nonconfined residential heating fires, interior wall coverings, such as cloth wall coverings and wood paneling, were the items ignited first.

Figure 5. Item first ignited in nonconfined residential building heating fires by major category (2013-2015)



Source: NFIRS 5.0.
Note: Total of nonconfined residential building heating fires with item first ignited determined does not add up to 100 percent due to rounding.

Equipment involved in ignition of nonconfined residential building heating fires

In addition to the unspecified heating category, four types of equipment played a leading role in the ignition of 75 percent of nonconfined residential heating fires. These leading types of equipment involved in ignition of nonconfined residential heating fires, as shown in Table 5, were heating stoves (18 percent), unspecified heating (16 percent), heaters (15 percent), water heaters (14 percent) and furnaces (11 percent).[19] "Heaters" include floor furnaces, wall heaters and baseboard heaters.[20] "Water heaters" include sink-mounted instant hot water heaters and water-bed heaters. "Furnaces" include local and central heating units.

Table 5. Leading equipment involved in ignition of nonconfined residential building heating fires (2013-2015)

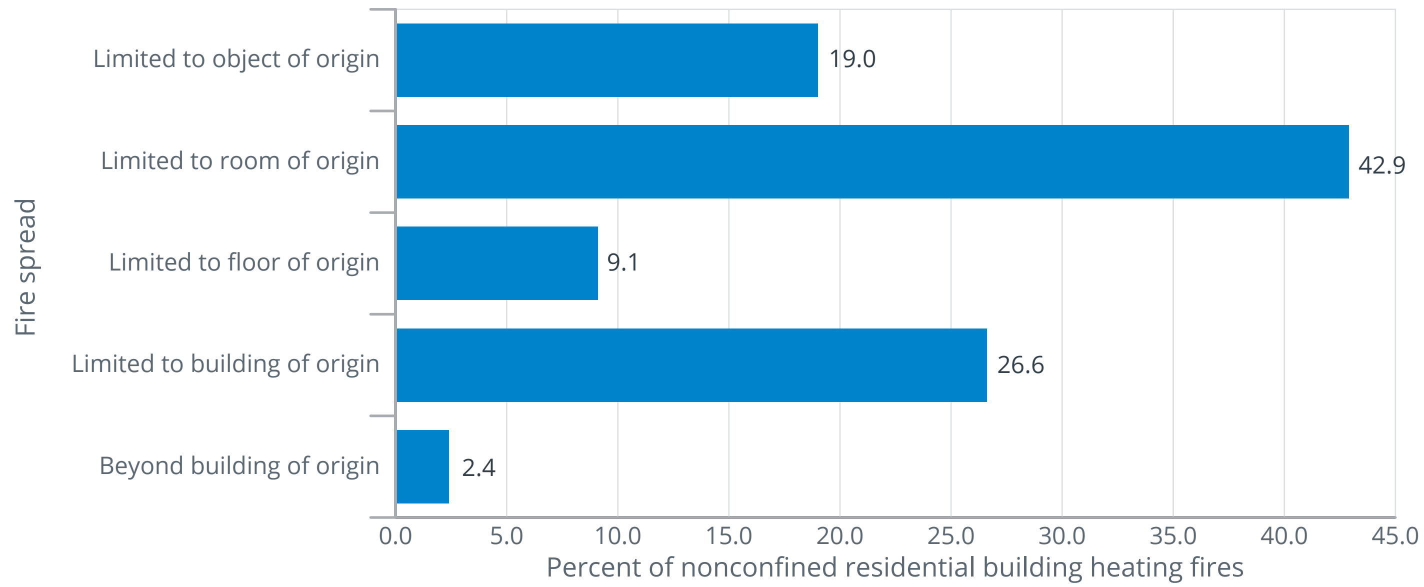
Equipment involved in ignition	Percent of nonconfined residential building heating fires
Heating stove	17.9
Heating, unspecified	16.4
Heater	15.4
Water heater	14.2
Furnace (local and central heating units)	11.1

Source: NFIRS 5.0.

Fire spread in nonconfined residential building heating fires

Figure 6 shows the majority of nonconfined residential heating fires (62 percent) were limited to the object (19 percent) or room (43 percent) of fire origin.[21] The fire spread profile for nonconfined residential heating fires followed a pattern similar to the fire spread profile for all nonconfined residential fires, with more nonconfined heating fires being limited to the room or object of origin.[22]

Figure 6. Extent of fire spread in nonconfined residential building heating fires (2013-2015)



Source: NFIRS 5.0.

Factors contributing to ignition in nonconfined residential building heating fires

Table 6 shows the categories of factors contributing to ignition in nonconfined residential heating fires. "Misuse of material or product" was the leading category contributing to the ignition of nonconfined residential heating fires (36 percent). "Operational deficiency" was the second leading category and contributed to 22 percent of nonconfined residential heating fires. "Electrical failure or malfunction" was the third leading category at 20 percent. These three categories played a role in 78 percent of nonconfined residential heating fires.

Heat source too close to combustibles (29 percent) was by far the leading specific factor contributing to ignition. This specific factor was more than twice the second leading factor contributing to ignition, which was miscellaneous mechanical failure/malfunction (12 percent).

Table 6. Factors contributing to ignition for nonconfined residential building heating fires by major category (where factors contributing to ignition are specified, 2013-2015)

Factor contributing to ignition category	Percent of nonconfined residential building heating fires (unknowns apportioned)
Misuse of material or product	36.3
Operational deficiency	21.7
Electrical failure, malfunction	20.0
Mechanical failure or malfunction	18.5
Design, manufacture, installation deficiency	6.5
Other factors contributing to ignition	2.6
Natural condition	0.8
Fire spread or control	0.8

Source: NFIRS 5.0.
Notes: 1. Includes only incidents where factors that contributed to the ignition of the fire were specified.
2. Multiple factors contributing to fire ignition may be noted for each incident; total will exceed 100 percent.

Alerting/Suppression systems in residential building heating fires

Fire fatalities and injuries have declined over the last 35 years, partly due to new technologies to detect and extinguish fires. Smoke alarms are present in most homes. Nationally, only 3 percent of households lack smoke alarms.[23] In addition, the use of residential sprinklers is widely supported by the fire service and is gaining support within residential communities.

Smoke alarm data is available for both confined and nonconfined fires, although the data is very limited in scope for confined fires. Since different levels of data are reported on smoke alarms in confined and nonconfined fires, the analyses are performed separately. Note that the data presented in Tables 7 to 9 are the raw counts from the NFIRS dataset and are not scaled to national estimates of smoke alarms in residential heating fires. In addition, the NFIRS does not allow for the determination of the type of smoke alarm (i.e., photoelectric or ionization) or the location of the smoke alarm with respect to the area of fire origin.

Smoke alarms in nonconfined residential building heating fires

Smoke alarms were reported as present in 54 percent of nonconfined residential heating fires (Table 7). In 23 percent of nonconfined residential heating fires, there were no smoke alarms present. In another 23 percent of these fires, firefighters were unable to determine if a smoke alarm was present. Thus, smoke alarms were potentially missing in 23 to 46 percent of these fires that had the ability to spread and possibly result in fatalities.

Table 7. Presence of smoke alarms in nonconfined residential building heating fires (2013-2015)

Presence of smoke alarms	Percent
Present	53.6
None present	23.4
Undetermined	23.0
Total	100.0

Source: NFIRS 5.0.

While only 5 percent of all nonconfined residential heating fires occurred in residential buildings that were **not** currently or routinely occupied, these buildings — which were under construction, undergoing major renovation, vacant and the like — are unlikely to have alerting and suppression systems that are in place and, if in place, that are operational. In fact, only 22 percent of all nonconfined heating fires in unoccupied residential buildings were reported as having smoke alarms that operated. As a result, the detailed smoke alarm analyses in the next section focus on nonconfined heating fires in occupied residential buildings only.

Smoke alarms in nonconfined heating fires in occupied residential buildings

Smoke alarms were reported as present in 55 percent of nonconfined heating fires in occupied residential buildings (Table 8). In 23 percent of nonconfined heating fires in occupied residential buildings, there were no smoke alarms present. In another 23 percent of these fires, firefighters were unable to determine if a smoke alarm was present.[24] Unfortunately, in 38 percent of the fires where the presence of a smoke alarm was undetermined, either the flames involved the building of origin or spread beyond it. The fires were so large and destructive that it is unlikely the presence of a smoke alarm could be determined.

When smoke alarms were present (55 percent) and the alarm operational status was considered, the percentage of smoke alarms reported as present consisted of:

- Present and operated — 32 percent.
- Present but did not operate — 15 percent (alarm failed to operate, 7 percent; fire too small, 8 percent).
- Present but operational status unknown — 8 percent.

When the subset of incidents where smoke alarms were reported as present was analyzed separately as a whole, smoke alarms were reported to have operated in 59 percent of the incidents and failed to operate in 13 percent. In another 14 percent of this subset, the fire was too small to activate the alarm. The operational status of the alarm was undetermined in 14 percent of these incidents.

If a fire occurs, properly installed and maintained smoke alarms provide an early warning signal to everyone in a home. Smoke alarms help save lives and property. The USFA continues to partner with other government agencies and fire service organizations to improve and develop new smoke alarm technologies. More information on smoke alarm technologies, performance, disposal and storage, training bulletins, and public education and outreach materials can be found at https://www.usfa.fema.gov/prevention/technology/smoke_fire_alarms.html. Additionally, the USFA's position statement on smoke alarms is available at https://www.usfa.fema.gov/about/smoke_alarms_position.html.

Table 8. NFIRS smoke alarm data for nonconfined heating fires in occupied residential buildings (2013-2015)

Presence of smoke alarms	Smoke alarm operational status	Smoke alarm effectiveness	Count	Percent
Present	Fire too small to activate smoke alarm		1,522	7.9
	Smoke alarm operated	Smoke alarm alerted occupants, occupants responded	4,724	24.5
		Smoke alarm alerted occupants, occupants failed to respond	184	1.0
		No occupants	674	3.5
		Smoke alarm failed to alert occupants	156	0.8
		Undetermined	443	2.3
	Smoke alarm failed to operate		1,339	6.9
	Undetermined		1,478	7.7
None present			4,376	22.7
Undetermined			4,396	22.8
Total incidents			19,292	100.0

Source: NFIRS 5.0.

Note: The data presented in this table are raw data counts from the NFIRS dataset summed (not averaged) from 2013 to 2015. They do not represent national estimates of smoke alarms in nonconfined heating fires in occupied residential buildings. They are presented for informational purposes. Total does not add up to 100 percent due to rounding.

Smoke alarms in confined residential building heating fires

Less information about smoke alarm status is reported for confined fires, but the data still give important insights about the effectiveness of alerting occupants in these types of fires. It is especially important to look at the limited information provided for these fires, since 75 percent of residential heating fires were confined fires. The analyses presented here do not differentiate between occupied and unoccupied residential buildings, as this data detail is not required when reporting confined fires in the NFIRS. However, an assumption may be made that confined fires are fires in occupied housing, as these types of fires are unlikely to be reported in residential buildings that are not occupied.

Smoke alarms alerted occupants in 20 percent of the reported confined residential heating fires (Table 9). Occupants were not alerted by the smoke alarm in 26 percent of the confined fires.[25] In 54 percent of these confined fires, the smoke alarm effectiveness was unknown.

Table 9. NFIRS smoke alarm data for confined residential building heating fires (2013-2015)

Smoke alarm effectiveness	Count	Percent
Smoke alarm alerted occupants	12,028	20.2
Smoke alarm did not alert occupants	15,436	25.9
Unknown	32,032	53.8
Total incidents	59,496	100.0

Source: NFIRS 5.0.

Note: The data presented in this table are raw data counts from the NFIRS dataset summed (not averaged) from 2013 to 2015. They do not represent national estimates of smoke alarms in confined residential building heating fires. They are presented for informational purposes. Total does not add up to 100 percent due to rounding.

Automatic extinguishing systems in nonconfined heating fires in occupied residential buildings

Automatic extinguishing system (AES) data are available for both confined and nonconfined fires, although for confined fires, the data is also very limited in scope. In confined residential building fires, an AES was present in 1 percent of reported incidents.[26,27] In addition, the following AES analyses focus on nonconfined heating fires in occupied residential buildings only, as even fewer AESs are present in unoccupied housing.

Full or partial AESs were present in only 4 percent of nonconfined heating fires in occupied residential buildings (Table 10). While the use of residential sprinklers is widely supported by the fire service and is gaining support within residential communities, the lack of AESs is not unexpected, as they are not yet widely installed. In fact, AESs were present in only 4 percent of **all** nonconfined fires in occupied residential buildings.[28]

Table 10. NFIRS automatic extinguishing system data for nonconfined heating fires in occupied residential buildings (2013-2015)

Automatic extinguishing system presence	Count	Percent
Automatic extinguishing system present	794	4.1
Partial system present	21	0.1
Automatic extinguishing system not present	17,665	91.6
Unknown	812	4.2
Total incidents	19,292	100.0

Source: NFIRS 5.0.

Note: The data presented in this table are raw data counts from the NFIRS dataset summed (not averaged) from 2013 to 2015. They do not represent national estimates of AESs in nonconfined heating fires in occupied residential buildings. They are presented for informational purposes.

Residential sprinkler systems help to reduce the risk of deaths and injuries, homeowner insurance premiums, and uninsured property losses. Yet many homes do not have AESs, although they are often found in hotels and businesses. Sprinklers are required by code in hotels and many multifamily residences. There are major movements in the U.S. fire service to require sprinklers in all new homes. At present, however, they are largely absent in residences nationwide.[29]

The USFA and fire service officials across the nation are working to promote and advance residential fire sprinklers. More information on costs and benefits, performance, training bulletins, and public education and outreach materials regarding residential sprinklers is available at https://www.usfa.fema.gov/prevention/technology/home_fire_sprinklers.html. Additionally, the USFA's position statement on residential sprinklers is available at https://www.usfa.fema.gov/about/sprinklers_position.html.

Examples

The following are recent examples of residential heating fires reported by the media:

- April 2017: A propane heater that was accidentally tipped over caused a fire and resulted in major damage to a single-story house in El Paso, Texas. The fire started around 6:40 p.m. in an enclosed front porch area of the home. The house was fully engulfed in flames when fire crews arrived. A male occupant of the home was able to escape and was treated at the scene. About 85 percent of the house was damaged by the blaze and losses were estimated at $60,000.[30]
- February 2017: A single-story house was extensively damaged by fire in Salisbury, Maryland. The fire was believed to have started in the kitchen by a spark from an electric space heater. A 59-year-old man suffered burn injuries and was transported to John Hopkins Bayview Burn Center. The fire resulted in an estimated $60,000 in property damage and an additional $20,000 in contents damage. Two occupants of the home were reported to be displaced by the fire.[31]

- February 2017: A wall heater likely caused the ignition of a fire that broke out in a single-level apartment complex in Shippenville, Pennsylvania, around 10:40 a.m. The occupants of the apartment unit where the fire started had evacuated the building by the time firefighters arrived, and all other apartments were evacuated with no reported injuries. Two apartment units were severely damaged by the blaze, and another unit sustained minor damage; however, no estimates on losses were reported.[32]

- February 2017: One unit of a multifamily residence in Yakima, Washington, was destroyed by a fire caused by a space heater. The fire department responded to the scene around 5 p.m. The fire burned through the floor of the unit and spread up the walls into the attic. Officials reported that the heater was placed in a crawl space to prevent pipes from freezing. The other two units of the triplex sustained smoke damage. Damages were estimated at $20,000, and there were no reports of injuries.[33]

NFIRS data specifications for residential building heating fires

Data for this report were extracted from the NFIRS annual Public Data Release files for 2013, 2014 and 2015. Only Version 5.0 data were extracted.

Residential building heating fires were defined using the following criteria:

- Aid Types 3 (mutual aid given) and 4 (automatic aid given) were excluded to avoid double counting of incidents.

- Incident Types 111, 114, 116, 120 to 123:[34]

Incident Type	Description
111	Building fire
114	Chimney or flue fire, confined to chimney or flue
116	Fuel burner/boiler malfunction, fire confined
120	Fire in mobile property used as a fixed structure, other
121	Fire in mobile home used as fixed residence
122	Fire in motor home, camper, recreational vehicle
123	Fire in portable building, fixed location

Note: Incident Types 114 and 116 do not specify if the structure is a building.

- Property Use Series 400, which consists of the following:

Property Use	Description
400	Residential, other
419	One- or two-family dwelling
429	Multifamily dwelling
439	Boarding/Rooming house, residential hotels
449	Hotel/Motel, commercial
459	Residential board and care
460	Dormitory-type residence, other
462	Sorority house, fraternity house
464	Barracks, dormitory

- Structure Type:
  - For Incident Types 114 and 116:
    - 1—Enclosed building, or
    - 2—Fixed portable or mobile structure, or
    - Structure Type not specified (null entry).
  - For Incident Types 111 and 120 to 123:
    - 1—Enclosed building, or
    - 2—Fixed portable or mobile structure.
- The USFA Structure Fire Cause Methodology was used to determine residential building heating fire incidents.[35] Heating fire incidents involving heating stoves and food were believed to be cooking fires. As a result, fires with equipment involved in Ignition Code 124 (stove, heating) and Item First Ignited Code 76 (cooking materials, includes edible materials for man or animal, excludes cooking utensils) were excluded from the heating cause category.

The analyses contained in this report reflect the current methodologies used by the USFA. The USFA is committed to providing the best and most current information on the U.S. fire problem and continually examines its data and methodology to fulfill this goal. Because of this commitment, data collection strategies and methodological changes are possible and do occur. As a result, analyses and estimates of the fire problem may change slightly over time. Previous analyses and estimates on specific issues (or similar issues) may have used different methodologies or data definitions and may not be directly comparable to the current ones.

Information regarding the USFA's national estimates for residential building fires, as well as the data sources used to derive the estimates, can be found in the document "Data Sources and National Estimates Methodology Overview for U.S. Fire Administration's Topical Fire Report Series (Volume 18)," https://www.usfa.fema.gov/downloads/pdf/statistics/data_sources_and_national_estimates_methodology_vol18.pdf. This document also addresses the specific NFIRS data elements analyzed in the topical reports, as well as "unknown" data entries and missing data.

To request additional information, visit https://www.usfa.fema.gov/contact.html. To comment on this specific report, visit https://apps.usfa.fema.gov/contact/dataReportEval?reportTitle=Heating%20Fires%20in%20Residential%20Buildings%20(2013-2015).

Notes:

[1]In this topical report, fires are rounded to the nearest 100, deaths to the nearest five, injuries to the nearest 25, and dollar loss to the nearest $1 million. National estimates are based on 2013 to 2015 native Version 5.0 data from the NFIRS, residential structure fire loss estimates from the NFPA's annual surveys of fire loss, and the USFA's residential building fire loss estimates: https://www.usfa.fema.gov/data/statistics/order_download_data.html. Further information on the USFA's residential building fire loss estimates can be found in the "National Estimates Methodology for Building Fires and Losses," August 2012, https://www.usfa.fema.gov/downloads/pdf/statistics/national_estimate_methodology.pdf. For information on the NFPA's survey methodology, see the NFPA's report "Fire Loss in the United States During 2015," September 2016, http://www.nfpa.org/research/reports-and-statistics/fires-in-the-us/overall-fire-problem/fire-loss-in-the-united-states.

[2]In the NFIRS Version 5.0, a structure is a constructed item of which a building is one type. In previous versions of the NFIRS, the term "residential structure" commonly referred to buildings where people live. To coincide with this concept, the definition of a residential structure fire for the NFIRS 5.0 includes only those fires where the NFIRS 5.0 structure type is 1 or 2 (enclosed building and fixed portable or mobile structure) with a residential property use. Such structures are referred to as "residential buildings" to distinguish these buildings from other structures on residential properties that may include fences, sheds and other uninhabitable structures. In addition, confined fire incidents that have a residential property use but do not have a structure type specified are presumed to occur in buildings. Nonconfined fire incidents that have a residential property use without a structure type specified are considered to be invalid incidents (structure type is a required field) and are not included.

[3]The term "residential buildings" includes what are commonly referred to as "homes," whether they are one- or two-family dwellings or multifamily buildings. It also includes manufactured housing, hotels and motels, residential hotels, dormitories, assisted living facilities, and halfway houses — residences for formerly institutionalized individuals (patients with mental disabilities, drug addicts, or those formerly incarcerated) that are designed to facilitate their readjustment to private life. The term "residential buildings" does not include institutions, such as prisons, nursing homes, juvenile care facilities, or hospitals, even though people may reside in these facilities for short or long periods of time.

[4]For the purposes of this analysis, residential building heating fires are defined as those residential buildings (defined in endnote 3) for which the cause of the fire was determined to be heating. However, for the confined fire portion of residential building fires, only those with Incident Types 114 and 116 were included; all other confined fire types were excluded.

[5]Fire in the United States 1983-1990, Eighth Edition, USFA, Federal Emergency Management Agency, October 1993.
[6]"Residential Building Heating Fire Trends (2006-2015)," USFA Fire Estimate Summary Series, https://www.usfa.fema.gov/downloads/pdf/statistics/res_bldg_fire_estimates.pdf (May 2017).
[7]"Residential Building Fires (2013-2015)," USFA, June 2017, Volume 18, Issue 1, https://www.usfa.fema.gov/downloads/pdf/statistics/v18i1.pdf.
[8]Fire department participation in the NFIRS is voluntary; however, some states do require their departments to participate in the state system. Additionally, if a fire department is a recipient of a Fire Act Grant, participation is required. From 2013 to 2015, 67 percent of the NFPA's annual average estimated 1,294,500 fires to which fire departments responded were captured in NFIRS. Thus, the NFIRS is not representative of all fire incidents in the U.S. and is not a "complete" census of fire incidents. Although the NFIRS does not represent 100 percent of the incidents reported to fire departments each year, the enormous dataset exhibits stability from one year to the next without radical changes. Results based on the full dataset are generally similar to those based on part of the data.
[9]In NFIRS, confined fires are defined by Incident Type codes 113 to 118.
[10]The NFIRS distinguishes between "content" and "property" loss. Content loss includes losses to the contents of a structure due to damage by fire, smoke, water and overhaul. Property loss includes losses to the structure itself or to the property itself. Total loss is the sum of the content loss and the property loss. For confined fires, the expectation is that the fire did not spread beyond the container (or rubbish for Incident Type code 118); therefore, there was no property damage (damage to the structure itself) from the flames. However, there could be property damage as a result of smoke, water and overhaul.
[11]"Residential Building Fires (2013-2015)," USFA, June 2017, Volume 18, Issue 1, https://www.usfa.fema.gov/downloads/pdf/statistics/v18i1.pdf.
[12]The average fire death and fire injury loss rates computed from the national estimates above do not agree with average fire death and fire injury loss rates computed from the NFIRS data alone. The fire death rate computed from national estimates is (1,000 x 205/45,900) = 4.5 deaths per 1,000 residential building heating fires, and the fire injury rate is (1,000 x 725/45,900) = 15.8 injuries per 1,000 residential building heating fires.
[13]"One- and two-family residential buildings" include detached dwellings, manufactured homes, mobile homes not in transit, and duplexes. "Multifamily residential buildings" include apartments, town houses, row houses, condominiums, and other tenement properties. "Other residential buildings" include boarding/rooming houses, hotel/motels, residential board and care facilities, dormitory-type residences, sorority/fraternity houses, and barracks.
[14]"Residential Building Fires (2013-2015)," USFA, June 2017, Volume 18, Issue 1, https://www.usfa.fema.gov/downloads/pdf/statistics/v18i1.pdf.
[15]"One- and Two-Family Residential Building Fires (2013-2015)," USFA, June 2017, Volume 18, Issue 2, https://www.usfa.fema.gov/downloads/pdf/statistics/v18i2.pdf.
[16]"Multifamily Residential Building Fires (2013-2015)," USFA, June 2017, Volume 18, Issue 3, https://www.usfa.fema.gov/downloads/pdf/statistics/v18i3.pdf.
[17]For the purposes of this report, the time of the fire alarm is used as an approximation for the general time at which the fire started. However, in the NFIRS, it is the time at which the fire was reported to the fire department.
[18]As noted previously, confined building fires are small fire incidents that are limited in scope, are confined to noncombustible containers, rarely result in serious injury or large content loss, and are expected to have no significant accompanying property loss due to flame damage. In the NFIRS, confined fires are defined by Incident Type codes 113 to 118.
[19]Total does not add up to 75 percent due to rounding.
[20]"Heaters" exclude catalytic heaters, oil-filled heaters, and hot water heaters.
[21]A fire that is limited to a sofa or bed is not defined as a "confined fire" in the NFIRS because of the greater potential for spread. Unlike fires in pots or chimneys, there is no container to stop the fire, even though the fire did not spread beyond the object of origin.
[22]"Residential Building Fires (2013-2015)," USFA, June 2017, Volume 18, Issue 1, https://www.usfa.fema.gov/downloads/pdf/statistics/v18i1.pdf.
[23]Greene, Michael and Craig Andres, "2004-2005 National Sample Survey of Unreported Residential Fires," Division of Hazard Analysis, Directorate for Epidemiology, U.S. Consumer Product Safety Commission, July 2009.
[24]Total does not add to 100 percent due to rounding.
[25]In confined fires, the entry "smoke alarm did not alert occupants" can mean no smoke alarm was present; the smoke alarm was present but did not operate; the smoke alarm was present and operated, but the occupant/s was already aware of the fire; or there were no occupants present at the time of the fire.
[26]"Residential Building Fires (2013-2015)," USFA, June 2017, Volume 18, Issue 1, https://www.usfa.fema.gov/downloads/pdf/statistics/v18i1.pdf.
[27]As confined fires codes are designed to capture fires contained to noncombustible containers, it is not recommended to code a fire incident as a small-, low- or no-loss confined fire incident if the AES operated and contained the fire as a result. The preferred method is to code the fire as a standard fire incident with fire spread confined to the object of origin and provide the relevant information on AES presence and operation.
[28]"Residential Building Fires (2013-2015)," USFA, June 2017, Volume 18, Issue 1, https://www.usfa.fema.gov/downloads/pdf/statistics/v18i1.pdf.
[29]U.S. Department of Housing and Urban Development and U.S. Census Bureau, American Housing Survey for the United States: 2011, September 2013, "Health and Safety Characteristics-All Occupied Units (National)," Table S-01-AO, https://www.census.gov/content/dam/Census/programs-surveys/ahs/data/2011/h150-11.pdf (accessed May 3, 2017).
[30]Burge, David, "Propane heater causes fire at Lower Valley home," www.elpasotimes.com, April 2, 2017, http://www.elpasotimes.com/story/news/local/2017/04/02/propane-heater-causes-fire-lower-valley-home/99951274/ (accessed May 3, 2017).
[31]Culvyhouse, Henry, "Space heater likely cause of Salisbury house fire," www.delmarvanow.com, Feb. 27, 2017, http://www.delmarvanow.com/story/news/local/maryland/2017/02/27/space-heater-likely-cause-salisbury-house-fire/98475122/ (accessed May 3, 2017).
[32]Shindledecker, Scott, "Fire chief says wall heater cause of Shippenville fire," www.exploreclarion.com, Feb. 14, 2017, http://www.exploreclarion.com/2017/02/14/fire-chief-says-space-heater-cause-of-shippenville-fire/ (accessed May 3, 2017).

[33]Leal, Maria, "Space heater, the cause of a house fire in Yakima," www.yaktrinews.com, Feb. 1, 2017, http://www.yaktrinews.com/news/space-heater-cause-house-fire-yakima/361942350 (accessed May 3, 2017).
[34]Heating is defined by the equipment used to heat a residential building. Incident Types 113, 115, 117 and 118 were excluded because, by definition, these Incident Types were not heating fires.
[35]The USFA Structure Fire Cause Methodology is designed for structure fires of which buildings are a subset. This methodology was used to determine heating as a cause of fires in residential buildings. The cause methodology and definitions can be found in the document "National Fire Incident Reporting System Version 5.0 Fire Data Analysis Guidelines and Issues," July 2011, https://www.usfa.fema.gov/downloads/pdf/nfirs/nfirs_data_analysis_guidelines_issues.pdf.